TITLE:

REPORTS ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

AUTHOR(S):

CITATION:

REPORTS ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION. 泌尿器科紀要 1981, 27(12): 1559-1571

ISSUE DATE:

1981-12

URL:

http://hdl.handle.net/2433/122997

RIGHT:

京都大学学術情報リポジトリ KURENAI 紅 Kyoto University Research Information Repository

Acta Urol. Jap. Vol. 27
No. 12, December 1981

REPORTS ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

From the Internationl Continence Society Committee on Standardisation of Terminology

今回，私ども ICS 日本支部の考え方とつぎのような経緯によって "Reports on the standardisation of terminology of lower urinary tract function" を泌尿器科紀要に掲載することになりました．

1) ICS (International Continence Society) (会員，約570名，各国) の中で，日本人会員が ICS 日本支部を設立し (36名，6.3%)，責任者は互選の結果，まず今林が担当することになった．

2) ICS に対し，日本の神経因性膀胱研究会 (Neurogenic Bladder Society, NBS)，および米国の Urodynamic Society (UDS) は対等な連帯関係にある．

3) ICS 内部機構の１つとしての Standardisation Committee of Terminology (for lower urinary tract function) の希望として，ICS に参加している各国 (個人単位が大部分で，支部形式をもっているのは，フランスとイタリア) の学術雑誌に，前述の論文を掲載してもらいたいということがある．

4) ICS 日本支部はこれを受けて，その目的のために努力することにした．

東北大学医学部泌尿器科学教室
ICS 日本支部　責任者
(今林健一)

FIRST REPORT* ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

Incontinence, cystometry, urethral closure pressure profile, and units of measurement

This report contains the first set of recommendations dealing with the terminology of lower urinary tract function. Specifically, it covers the storage of urine in the bladder, urinary incontinence, and units of measurement. The recommendations were subject to discussion during the Fourth Annual Meeting of the International Continence Society (I.C.S.) in Mainz, Germany, in September 1974.

These standards are proposed to facilitate comparison of results by investigators who use urodynamic methods. It is recommended that the acknowledgement of these standards in written publications be indicated by a footnote to the section " Methods and Materials " or its equivalent: " Methods, definitions, and units conform to the standards proposed by the International Continence Society except where specifically noted."

URINARY INCONTINENCE

Incontinence is a condition where involuntary loss of urine is a social or hygienic problem and is objectively demonstrable. Loss of urine through channels other than the urethra is extra-urethral incontinence.

Stress incontinence denotes: (1) a symptom,

*) Revised following discussion during the business meeting of the International Continence Society, Mainz, 1974.
Members: Patrick Bates, William E. Bradley, Eric Glen, Hansjörg Melchior, David Rowan, Arthur Sterling, Tage Hald (Chairman).

(2) a sign, and (3) a condition=genuine stress incontinence. The *symptom* "stress incontinence" indicates the patient's statement of involuntary loss of urine when exercising physically (in the broadest possible sense of the words). The *sign* "stress incontinence" denotes the observation of involuntary loss of urine from the urethra immediately upon an increase in abdominal pressure. The *condition* "genuine stress incontinence" is involuntary loss of urine when the intravesical pressure exceeds the maximum urethral pressure but in the absence of detrusor activity.

Urge incontinence is involuntary loss of urine associated with a strong desire to void. Urge incontinence may be subdivided into *motor urge incontinence* which is associated with uninhibited detrusor contractions, and *sensory urge incontinence* which is not due to uninhibited detrusor contractions.

Reflex incontinence is involuntary loss of urine due to abnormal reflex activity in the spinal cord in the absence of the sensation usually associated with the desire to micturate.

Overflow incontinence is involuntary loss of urine when the intravesical pressure exceeds the maximum urethral pressure due to an elevation of intravesical pressure associated with bladder distension but in the absence of detrusor activity.

PROCEDURES RELATED TO THE EVALUATION OF URINE STORAGE

Cystometry

Cystometry is the method by which the pressure-volume relationship of the bladder is measured. Zero reference for pressure is the level of the superior edge of the symphysis pubis.

Specify:

Access: (1) transurethrally, (2) percutaneously.

Medium: (1) liquid, (2) gas.

Temperature: state temperature in degrees Celsius.

Position of patient: (1) supine, (2) sitting, (3) standing.

Filling: (1) continuous, (2) incremental. The precise filling rate should be stated.[1] When using incremental method, also state volume of increment.

Technique:

(1) Single or double lumen catheter or multiple catheters.
(2) Type of catheter (manufacturer)
(3) Size of catheter
(4) Measuring equipment

Findings: Before starting to fill, residual urine should be measured. The presence of contractions exceeding 15 cmH_2O clearly indicates an uninhibited detrusor contraction when the patient has been asked to inhibit. Pressure elevations smaller than 15 cmH_2O indicate that clinical judgement should be exercised. An indication of the volume at first desire to void should be made.

Maximum cystometric capacity is the volume at which the patient has a strong desire to void.

Effective cystometric capacity is the maximum cystometric capacity minus the residual urine.

Compliance indicates the change in volume for a change in pressure. It is defined as $C=\Delta V/\Delta p$ where ΔV is the volume increment and Δp is the change in pressure associated with this volume increment.

The ability to produce a detrusor contraction at will indicates intact nervous pathways from the cerebral cortex to the detrusor muscle. Its absence requires further evaluation before a diagnosis can be made. During cystometry, it is taken for granted that the patient is awake and not sedated. If otherwise, specify.

Urethral closure pressure profile

Urethral closure pressure profile denotes the intraluminal pressure along the length of the urethra with the bladder at rest.

Zero reference for pressure is the level of the superior edge of the symphysis pubis.

To be meaningful, bladder pressure should be measured simultaneously.

Specify:

[1] For general discussion, the following terms for the range of filling rate may be used: (1) up to 10 ml per minute is a *slow fill cystometry*, (2) 10–100 ml per minute is a *medium fill cystometry*, (3) over 100 ml per minute is a *rapid fill cystometry*.

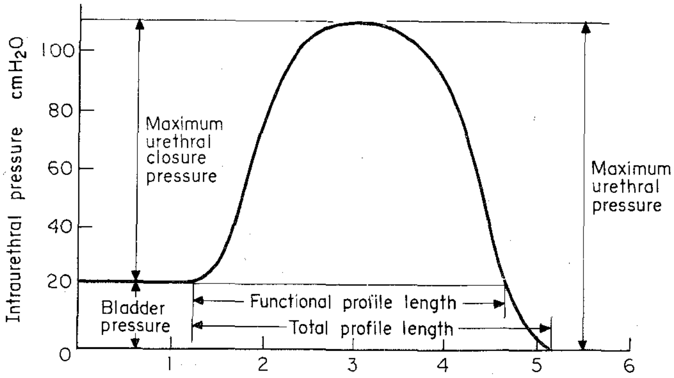

Fig. 1. A schematic representation of the urethal closure pressure profile.

(1) catheter type and size
(2) measurement technique
(3) rate of infusion
(4) continuous or intermittent withdrawal
(5) rate of withdrawal
(6) bladder volume
(7) position of patient: (i) supine, (ii) sitting (iii) standing

Findings (Fig. 1): *Maximum urethral pressure* is the maximum pressure of the measured profile. *Maximum urethral closure pressure* is the difference between the maximum urethral pressure and the bladder pressure. *Functional profile length* is the length of the urethra along which the urethral pressure exceeds bladder pressure. (*Total profile length* is not generally regarded as a clinically useful parameter).

UNITS OF MEASUREMENT

In current urodynamic literature there is no standardisation in the units of measurement. For example, intravesical pressure is sometimes measured in mmHg and sometimes in cmH_2O. When Laplace's law is used to calculate tension in the bladder wall, it is often found that pressure is then measured in dyne cm^{-2}. This lack of uniformity in the systems used leads to confusion when other parameters, which are a function of pressure, are computed, for instance, "compliance', "urethral resistance", etc. From these few examples it is evident that standardisation is essential for meaningful communication. Many journals now require that the results be given in SI units. This system will be used in all future I.C.S. papers. The following report is designed to give guidance in the application of the SI system to urodynamics and defines the units involved. The principal units to be used are listed below. A fuller explanation of the SI system is given in *Appendix A*.

Quantity	*Acceptable unit*	*Symbol*
volume	millilitre	ml
time	second	s
flowrate	millilitres/second	ml s^{-1}
pressure	centimetres of water[1]	cmH_2O
length	metre or submultiples	m, cm, mm
velocity	metres/second or submultiples	m s^{-1}, cm s^{-1}
temperature	degrees Celsius[2]	°C

[1] The SI Unit is the pascal, but it is only practical at present to calibrate our instruments in cmH_2O. One centimetre of water pressure is approx. equal to 100 pascals (1 cmH_2O=98.07 Pa). When calculating parameters that are a function of pressure, for example "compliance", the pascal must be used to avoid confusion. Measurements reported in mmHg will not be acceptable.

[2] The SI Unit is the degree Kelvin. The Kelvin temperature interval is identical with the degree Celsius (centigrade) temperature interval. The Kelvin scale starts at absolute zero (−273.16°C), and this is inconvenient in medical practice. The Celsius scale will therefore be used.

APPENDIX A
Le Système International d'Unités (SI Units)

At the Conférence Générale des Poids et Mesures (CGPM) in Paris in 1960 it was agreed internationally that this system of units (abbreviated to SI in all languages)

Table 1

arca	length^2	m^2	square metre
volume	length^3	m^3	cubic metre[1]
flowrate	volume per unit time	$m^3 s^{-1}$	cubic metres per sec.[2]
density	mass per unit volume	$kg\,m^{-3}$	kilogrammes per cubic metre
velocity	distance in unit time	$m\,s^{-1}$	metres per second
acceleration	velocity increase in unit time	$m\,s^{-2}$	metres per second per second
force	mass×acceleration	$kg\,m\,s^{-2}$	newton (N)
energy	force×displacement	N m	joule (J)
power	energy per unit time	$N\,m\,s^{-1}$	watt (W)
pressure	force per unit area	$N\,m^{-2}$	pascal (Pa)
stress	force per unit area	$N\,m^{-2}$	pascal (Pa)
tension	force per unit length	$N\,m^{-1}$	newtons per metre
momentum	mass×velocity	$kg\,m\,s^{-1}$	kilogramme metres per second
electric charge	electric current×time	A s	coulomb (C)
potential difference	energy to move 1 coulomb	joules/coulomb	volt (V)
electric resistance	potential difference for 1 ampere	volt per ampere	ohm (Ω)

[1] Another unit which is accepted is litre=1 dm^3.
[2] Another unit which is accepted is litres per second=$dm^3 s^{-1}$.

should be adopted for all scientific and technical work. It is an extension and refinement of the traditional metric system and is rational, coherent and comprehensive. It is therefore logical that this system should be used in all urodynamic studies.

There are seven fundamental units; all other units are derived from these. The three basic mechanical quantities are mass, length and time. The complete list is given below.

Quantity	*Unit*	*Symbol*
mass	kilogramme	kg
length	metre	m
time	second	s
temperature	kelvin	K
electric current	ampere	A
luminous intensity	candela	cd
amount of substance	mole	mol

As in the metric system a prefix may be added to the unit to indicate that a multiplier of the form 10^a has been applied.

Prefix	*Symbol*	*Multiplier*	*Remarks*
tera	T	10^{12}	
giga	G	10^{9}	
mega	M	10^{6}	
kilo	k	10^{3}	
hecto	h	10^{2}	1
deca	da	10^{1}	1
deci	d	10^{-1}	1,2
centi	c	10^{-2}	1,3
milli	m	10^{-3}	
micro	μ	10^{-6}	
nano	n	10^{-0}	
pico	p	10^{-12}	

Remarks:

(1) An endeavour is being made to reduce unnecessary fine division by discouraging the general use of exponent values, $a=+2, +1, -1, -2$.

(2) The prefix "deci" may be used to specify a volume of $10^{-3}\,m^3=1\,dm^3$ since the litre has been redefined as 1 dm^3 exactly.

(3) Although "centi" is one of the discouraged prefixes, it is too well established to be eliminated at the present time.

Derived SI units

These units are composed of combinations of the fundamental units; some of them have been given special names. A few examples of commonly used units are listed in Table I.

Use of SI units and their multiples

The symbol of a prefix is considered to be combined with the unit symbol to which it is directly attached forming a new unit symbol which can be raised to a positive or negative power.

e.g. $1\,cm^3=(10^{-2}\,m)^3=10^{-6}\,m^3$

$1\,kNm^{-2}=10^3\,N\,m^{-2}$

When expressing a quantity by a numerical value and a certain unit, it has been found convenient to use units resulting in numerical values between 0.1 and 1000.

e.g. 14300 N=14.3 kN

0.00564 m=5.64 mm.

SECOND REPORT** ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

Procedures related to the evaluation of micuturition: Flow rate, pressure measurement. Symbols

This report contains the second set of recommendations dealing with the terminology of lower urinary tract function. It covers micturition and recommendations for the use of symbols. The recommendations were subject to discussion during the Fifth Annual Meeting of the International Continence Society (I.C.S.) in Glasgow, Scotland, in September 1975.

These standards are proposed to facilitate comparison of results by investigators who use urodynamic methods. It is recommended that the acknowledgement of these standards in written publications be indicated by a footnote to the section "Methods and Material" or its equivalent: "Methods, definitions, and units conform to the standards proposed by the International Continence Society except where specifically noted."

Urodynamics encompasses the morphological, physiological, biomechanical and hydrodynamic aspects of urine transport. This report deals with the urodynamics of the lower urinary tract.

PROCEDURES RELATED TO THE EVALUATION OF MICTURITION

Flow rate

Flow rate is defined as the volume of fluid expelled via the urethra per unit time. It is expressed in ml/s.

Specify:

(1) Patient environment and position: (1) supine, (2) sitting, (3) standing.

(2) Filling: (1) by diuresis: (i) spontaneous, (ii) forced (specify regimen); (2) by catheter: (i) transurethral, (ii) suprapubic (state rate).

(3) Fluid: indicate temperature.

Technique:

(1) Measuring equipment.

(2) Solitary procedure or combined with other measurements.

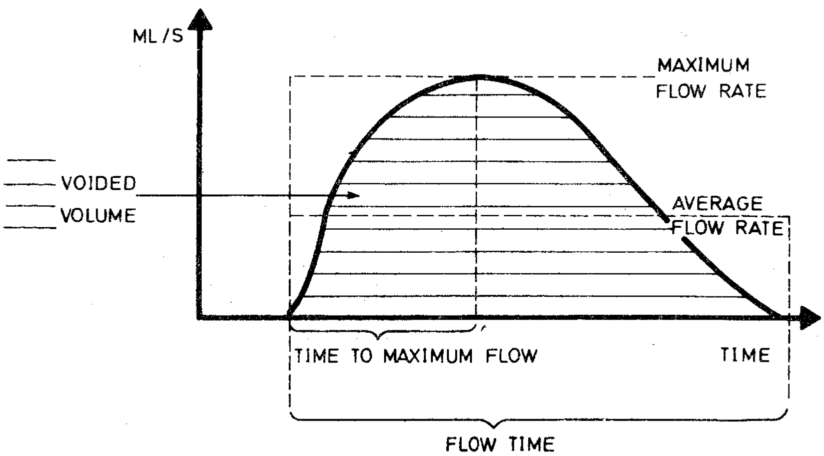

Fig. 1. Diagram of continous flow curve.

**) Revised following discussion during the business meeting of the International Continence Society, Antwerp, September 1976.

Members: Patrick Bates, Eric Glen, Derek Griffiths, Hansjörg Melchior, David Rowan, Arthur Sterling, Norman Zinner, Tage Hald (Chairman).

Definitions:

(1) Continuous flow (Fig. 1): *Flow time* is the time over which measurable flow actually occurs. *Time to maximum flow* is the elapsed time from onset of flow to maximum flow. *Maximum flow rate* is the maximum measured value of the flow rate. *Voided volume* is the total volume expelled via the urethra. *Average flow rate* is voided volume divided by flow time.

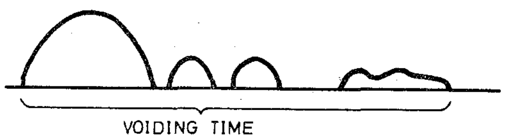

Fig. 2. Diagram of intermittent flow curve.

(2) Intermittent flow or continuous flow with substantial terminal dribbling (Fig.2): The same parameters are applicable if care is exercised in measuring flow time as defined above, i.e. time intervals between flow episodes are disregarded, or if the duration of very low terminal flow is disregarded.

Voiding time is total duration of micturition, i.e. includes interruptions. In continuous flow situation voiding time is equal to flow time.

Flow pattern: Specify pattern description. This cannot be defined at present and is best illustrated.

Comment: Measurement of the flow rate has value (*a*) as screening procedure, (*b*) in assessing results of treatment, (*c*) in assessing progression of disease. However, as an isolated measurement it has limitations. In particular it may have to be related to bladder pressure, initial and residual volume in the bladder and of course age and sex.

Pressure measurements during micturition

Zero reference for all pressure measurements is the level of the superior edge of the symphysis pubis. Pressures are expressed in cmH_2O.

Specify:

Access to intravesical pressure: (1) transurethral, (2) suprapubic, (3) telemetry.

Access to abdominal pressure: (1) rectal, (2) gastric, (3) intraperitoneal.

Position: (1) supine, (2) sitting, (3) standing.

Technique:

(1) Catheter type and size.

(2) Measuring equipment.

Definitions (Fig. 3): *Intravesical pressure* is the pressure within the bladder. *Abdominal pressure* is taken to be the pressure surrounding the bladder. In current practice it is estimated from rectal, gastric or intraperitoneal pressure. *Detrusor pressure* is that component of intravesical pressure which is created by forces in the bladder wall (passive and active). It is estimated by subtracting abdominal pressure from intravesical pressure.

Opening time is the elapsed time from

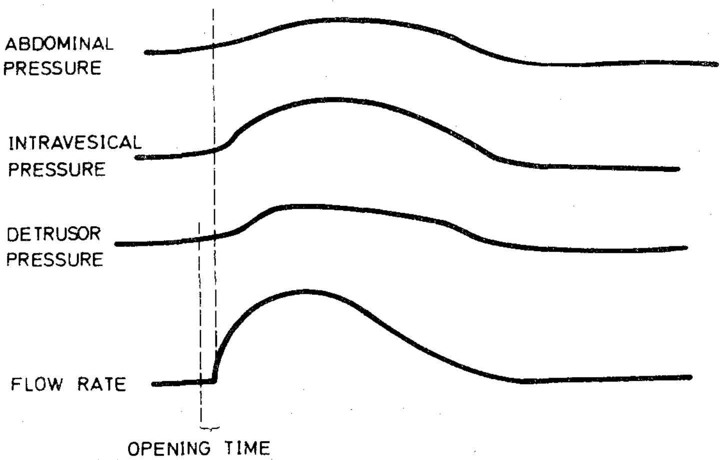

Fig. 3. Diagram of corresponding pressures and curve of flow. The order of presentation of curves as shown above is recommended.

Table 1. Parameters of pressure in the micuturition cycle

	Pressure curves		
	Intravesical	Abdominal	Detrusor
Premicturition pressure	Intravesical premicturition pressure	Abdominal premicturition pressure	Detrusor premicturition pressure
Opening pressure	Intravesical opening pressure	Abdominal opening pressure	Detrusor opening pressure
Maximum pressure	Maximum intravesical pressure	Maximum abdominal pressure	Maximum detrusor pressure
Pressure at maximum flow	Intravesical pressure at maximum flow	Abdominal pressure at maximum flow	Detrusor pressure at maximum flow
Contraction pressure at maximum flow	Intravesical contraction pressure at maximum flow	Abdominal contraction pressure at maximum flow	Detrusor contraction pressure at maximum flow

Table 2. List of symbols

Basic symbols		Urological qualifiers		Value	
Pressure	p	Bladder	ves	Maximum	max
Volume	V	Urethra	ura	Minimum	min
Flow rate	Q	Ureter	ure	Average	ave
Velocity	v	Detrusor	det		
Time	t	Abdomen	abd		
Temperature	T				
Length	l				
Area	A	Example:			
Diameter	d	$p_{ves,\,max}$ = maximum intravesical pressure			
Force	F				
Energy	E				
Power	P				
Compliance	C				
Work	W				

initial rise in detrusor pressure to onset of flow. This is the initial isovolumetric contraction period of micturition. Time lags should be taken into account.

The following parameters are applicable to measurements of each of the pressure curves: intravesical, abdominal and detrusor pressure (Table I): *Premicturition pressure* is the pressure recorded immediately before the initial isovolumetric contraction. *Opening pressure* is the pressure recorded at the onset of measured flow. *Maximum pressure* is the maximum value of the measured pressure. *Pressure at maximum flow* is the pressure recorded at maximum measured flow rate. *Contraction pressure at maximum flow* is the difference between pressure at maximum flow and premicturition pressure.

Postmicturition events are at present not well understood and so cannot be defined.

It is common practice to relate pressure and flow by calculation of a resistance factor. However, caution should be exercised in interpreting this number. The subject of resistance factors will be dealt with in a later report.

SYMBOLS

It is often helpful to use symbols in a communication. The system below has been devised to standardise a code of symbols for use in urodynamics. The rationale of the system is to have a basic symbol representing the physical quantity with qualifying subscripts. The list of basic symbols largely conforms to international usage. The qualifying subscripts relate the basic symbols to commonly used urodynamic parameters (Table II). If all parameters were to be given standard symbols the system would be clumsy. If further qualifiers therefore are required they should follow this system and be defined.

THIRD REPORT*** ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

Procedures related to the evaluation of micuturition: Pressure-flow relationships. Residual urine

This report continues with recommendations on procedures related to the evaluation of micturition (1). It covers pressure-flow relationships and residual urine. These recommendations were subject to discussion during the Seventh Annual Meeting of the International Continence Society in Portoroz, Yugoslavia, September 1977.

These standards are proposed to facilitate comparison of results by investigators who use urodynamic methods. It is recommended that the acknowledgement of these standards in written publications be indicated by a footnote to the section "Methods and Material" or its equivalent: "Methods, definitions and units conform to the standards proposed by the International Continence Society except where specifically noted."

PRESSURE-FLOW RELATIONSHIPS

To accomplish micturition a driving pressure is necessary. The driving pressure for micturition is the pressure within the bladder. This pressure can be generated by detrusor contraction (p_{det}), by abdominal pressure (p_{abd}) or by both ($p_{ves}=p_{det}+p_{abd}$). The urethra is an irregular and distensible conduit whose walls and surroundings, which have active and passive elements, influence the flow of urine through it. The bladder and urethra each have their own characteristics and in combination these characteristics determine the pressure-flow relationships of micturition. The relationships vary throughout a micturition and, in one individual from one micturition to the next. Many attempts have been made to reduce the pressure-flow relationships to 'urethral resistance factors' in an attempt to distinguish between normal and pathological conditions.

The following formulae have all been used at one time or another.

1) p_{ves}/Q
2) p_{ves}/Q^2
3) $\sqrt{p_{ves}}/Q$
4) p_{det}/Q
5) p_{det}/Q^2
6) $(p_{ves}-E_{str})/Q$
7) $(p_{ves}-E_{str})/Q^2$
8) $(p_{ves}-E_{str})/p_{ves}$
9) $d_{ura.eff}=\left[\frac{32\rho flQ^2}{\Delta p g\pi^2}\right]^{0.2}$

E_{str} is the kinetic energy per unit volume in the external stream, sometimes (unfortunately) called the 'exit pressure', and $d_{ura.eff}$ is a calculated 'effective urethral diameter'.

ρ =density of fluid
f =Fanning's friction factor
l =urethral length
Δ_p =friction loss
g =acceleration due to gravity.

Ideally we should like to choose the most useful of the above formulae and recommend

***) Revised following discussion during the business meeting of the International Continence Society, Portoroz, Yugoslavia, September 1977.
Members: Patrick Bates, William E. Bradley, Eric Glen, Derek Griffiths, Hansjorg Melchior, David Rowan, Arthur Sterling, Tage Hald (Chairman).

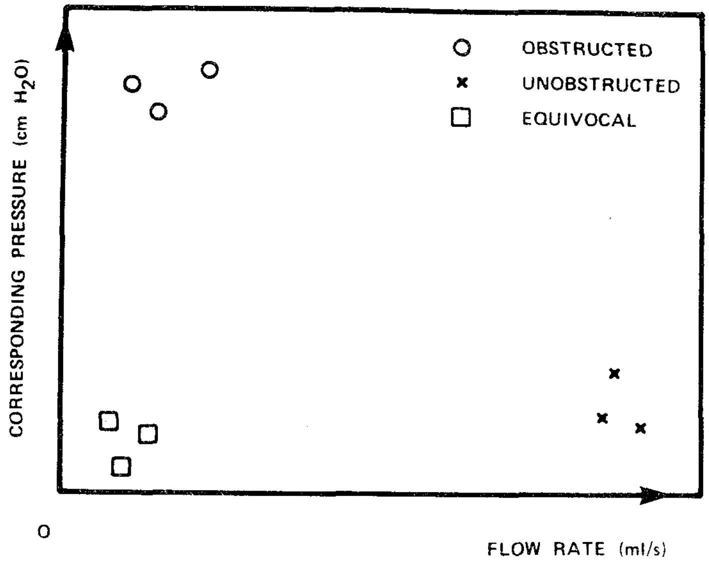

Fig. 1. Recommended presentation of pressure-flow relationships. The points shown are purely illustrative to indicate how the data might fall into groups.

it for general use. However, all of them originate from rigid tube hydrodynamics. The urethra is not a rigid tube. Therefore these factors vary not only during micturition but also from one micturition to another and so cannot provide a valid comparison between patients. They may be even misleading.

However, pressure-flow studies are still valuable since some characteristic pressure-flow patterns may be identified. For example:

(a) low flow rate accompanied by high pressure indicates obstruction,

(b) high flow rate accompanied by low pressure indicates freedom from obstruction.

(c) intermittent flow rate associated with abdominal contractions and absence of detrusor activity indicates motor impairment of the detrusor,

(d) intermittent interruptions of the flow in the absence of abdominal straining, with concomitant increases in the intravesical pressure, indicate intermittent contractions of the urethral and/or periurethral striated musculature.

In all cases the urodynamic findings should be assessed in conjunction with the results of routine urological investigations.

Presentation of pressure-flow relationships

It is suggested that it is more useful to present both the flow rate and the corresponding intravesical or detrusor pressure (p_{ves} or p_{det}), rather than to relay on a 'urethral resistance factor'. It is common to relate the maximum flow rate to the pressure at maximum flow, but any instant during micturition can be examined in the way proposed.

When presenting data from a group of patients, pressure-flow relationships may be shown on a graph as illustrated in Fig. 1. This form of presentation allows lines of demarcation to be drawn on the graph to separate the results according to the problem being studied. The points shown in the figure are purely illustrative to indicate how the data might fall into groups. The group of equivocal results might include either an unrepresentative micturition in an obstructed or an unobstructed patient, or detrusor insufficiency with or without obstruction. This is the group which invalidates the use of 'urethral resistance factors'.

RESIDUAL URINE

Residual urine is defined as the volume of fluid remaining in the bladder immediately following the completion of micturition.

The measurement of residual urine forms an integral part of the study of miturition. It is commonly estimated by the following methods:

1) palpation
2) catheter or cystoscope, (i) transurethral, (ii) suprapubic
3) radiography, (i) intravenous urography, (ii) micturition cystography
4) ultrasonics, (i) A-scan, (ii) B-scan
5) radioisotopes, (i) clearance, (ii) gamma camera.

Residual urine may result from various causes, such as detrusor insufficiency, infravesical obstruction or psychological inhibition. In the condition of vesico-ureteral reflux, urine may re-enter the bladder after micturition and may falsely be interpreted as residual urine. The presence of urine in bladder diverticula following micturition presents special problems of interpretation, since a diverticulum may be regarded either as part of the bladder cavity or as outside the functioning bladder.

The methods mentioned above each have limitations as to their applicability and accuracy in the various conditions associated with residual urine. Therefore it is necessary to choose a method appropriate to the clinical problem.

The absence of residual urine is an observation of clinical value. An isolated finding of residual urine requires confirmation before being considered significant. The absence of residual urine does not exclude the possibility of bladder dysfunction or infravesical obstruction.

In infravesical obstruction there is a variable and poorly understood connection between the occurrence of residual urine and abnormalities in the pressure-flow relationships. In the study of this condition both need to be taken into account and their interrelation could be a fruitful area for future research.

REFERENCES

1. Bates P, Glen E, Griffiths H, Melchior D, Rowan D, Sterling N, Zinner N, Hald T (The International Continence Society Committee on Standardisation of Terminology) 1977. Second report on the standardisation of terminology of the lower urinary tract function. *Scand J Urol Nephrol* **11: 197.**

FOURTH REPORT**** ON THE STANDARDISATION OF TERMINOLOGY OF LOWER URINARY TRACT FUNCTION

Terminology related to neuromuscular dysfunction of the lower urinary tract

INTRODUCTION

This report deals with recommendations on terminology related to neuromuscular dysfunction of the lower urinary tract with particular reference to classification of the neuropathic bladder.

These standards are proposed to facilitate comparison of results by investigators who use urodynamic methods. It is recommended that the acknowledgement of these standards in written publications be indicated by a footnote to the section "Methods and Material" or its equivalent.

"Methods, definitions, and units conform to the standards proposed by the International Continence Society except where specifically

****) Produced by the International Continence Society Committee on Standardisation of Terminology, following discussion at the International Continence Society Meetings in Manchester, September 1978 and in Rome, October 1979.

Members:

Patrick Bates	Torsten Sundin
William E. Bradley	David Thomas
Eric Glen	Michael Torrens
Hansjörg Melchior	Richard Turner-Warwick
David Rowan	Norman R. Zinner
Arthur M. Sterling	Tage Hald (chairman)

noted."

Lower urinary tract dysfunction may be caused by: 1. Disturbance of the pertinent nervous or psychological control systems. 2. Disorders of muscle function. 3. Structural abnormalities.

The term *neuromuscular dysfunction* includes the first two categories.

Classifications based on concepts of the cause of a dysfunction, especially on the site of a neurological lesion may be confusing. A lesion is often difficult to locate with certainty and different lesions may produce identical functional changes in the lower urinary tract. Therefore such a classification gives little help when considering the management of the end organ abnormality. Without objective information about the function it is impossible to compare results of treatment from different centres. An underlying neurological pathology is, of course, equally important from a prognostic, therapeutic and counselling point of view and must be considered at the same time.

The increasing use of urodynamic methods has made it possible to classify disorders of the detrusor and urethral closure mechanism with some accuracy. However, the range of bladder and urethral abnormalities cannot fully be defined at the present time.

This report presents a basic classification of function. Only neuromuscular function is considered, leaving structural organ changes and complicating factors aside. The lower urinary tract is composed of the *bladder* and *urethra*. They form a functional unit and their interaction cannot be ignored. Each has two functions, the bladder to store and void, the urethra to control and convey. When a reference is made to the hydrodynamic function or to the whole anatomical unit as a storage organ - the vesica urinaria - the correct term is the *bladder*. When the specific smooth muscle structure known as the m. detrusor urinae is being discussed, the correct term is the *detrusor*.

For simplicity the bladder/detrusor and the urethra will be considered separately so that a classification based on a combination of functional anomalies can be reached. No attempt has been made to define these in a quantitative way or to consider efficiency. *Sensation* cannot be accurately evaluated, but must be assessed. This classification depends on the results of various objective urodynamic investigations. The number of specific tests may filling and voiding phases are essential for each patient. Terms used should be objective, definable and ideally should be applicable to the whole range of abnormality. When authors disagree with the classification presented below, or use terms that have not been defined here, their meaning should be made clear.

DETRUSOR FUNCTION

The detrusor function may be:

1) normal
2) overactive
3) underactive

Activity in this context is related to detrusor contractions interpreted from intravesical (p_{ves}) or detrusor pressure (p_{det}) changes, preferably the latter. Assessment of activity must be made during both filling and voiding, and the classification may change between these two phases.

Normal detrusor function

During the filling phase the bladder contents increase in volume without a significant rise in pressure (accommodation). No involuntary contractions occur despite provocation. Normal voiding is achieved by a voluntarily initiated detrusor contraction that is sustained and can be suppressed voluntarily. A normal detrusor so defined may be described as 'stable'.

Overactive detrusor function

Overactive detrusor function is indicated when during the filling phase there are involuntary detrusor contractions, which may be spontaneous or provoked, that the person cannot supress. Provocation includes rapid filling, alterations of posture, coughing walking, jumping and other triggering procedures. Voiding may be due to involuntary contractions or voluntary contractions that cannot be supressed.

Various terms have been used to describe these features and they are defined as follows:

The *unstable detrusor* is one that is shown objectively to contract, spontaneously or on provocation, during the filling phase while the patient is attempting to inhibit micturition. The unstable detrusor may be asymptomatic, and its presence does not necessarily imply a neurological disorder.

Detrusor hyperreflexia is defined as overactivity due to disturbance of the nervous mechanisms. Whether the unstable detrusor is synonymous with detrusor hyperreflexia is unknown at present. Until this controversy is resolved, detrusor hyperreflexia should be confirmed by objective evidence of a neurological disorder.

The use of conceptual and undefined terms such as hypertonic, uninhibited, spastic and automatic should be avoided. When referring to the volume/pressure relationship in a bladder with a high pressure rise the correct term is a *low-compliance bladder*[1] (e.g. a shrunken bladder following radiotherapy).

Underactive detrusor function

In the underactive detrusor there are no contractions during filling. During voiding the contraction may be absent or inadequately sustained. *A non-contractile detrusor* is one which does not contract under any circumstances. *Detrusor areflexia* exists where underactivity is due to an abnormality of nervous control and denotes the complete absence of centrally coordinated contraction. In detrusor areflexia due to a lesion of the conus medullaris or sacral nerve outflow, the detrusor should be described as *decentralised* - not denervated, since the peripheral neurons remain. The bladder function may be described as *autonomous*. In such bladders pressure fluctuations of low amplitude may occur. The use of terms such as atonic, hypotonic, autonomic and flaccid should be avoided. If the volume/pressure relationship of a bladder is referred to as being capacious with little change in pressure, then the correct term is a *high-compliance bladder*[1].

URETHRAL FUNCTION

The urethral closure mechanism may be:

1) normal
2) overactive
3) incompetent

Normal urethral closure mechanism

The *normal* urethral closure mechanism maintains a possitive urethral closure pressure during filling even in the presence of increased abdominal pressure. It may be overcome by detrusor overactivity. During micturition the normal closure pressure decreases to allow flow. The normal closure mechanism is capable of interrupting urination voluntarily.

Overactive urethral closure mechanism

An *overactive* urethral closure mechanism contracts involuntarily against a detrusor contraction or fails to relax at attempted micturition.

Synchronous detrusor and urethral contraction is *detrusor/urethral dyssynergia*. This diagnosis should be qualified by stating the location and type of the urethral muscles (striated or smooth) which are involved (figure 1).

detrusor/urethral dyssynergia	striated:	detrusor/sphincter dyssynergia
	smooth:	bladder neck: detrusor/bladder neck dyssynergia
		distal urethral

Fig. 1

Despite the confusion surrounding "sphincter" terminology the use of certain terms is so widespread that they are retained and defined here. The term *detrusor/sphincter dyssynergia* describes a detrusor contraction concurrent with an inappropriate contraction of the urethral and/or periurethral features the validity of this diagnosis should be questioned. The term *detrusor/bladder neck dyssynergia* is used to denote a detrusor contraction concurrent with an objectively demonstrated defect of bladder neck opening. No parallel term has been elaborated for possible detrusor/distal urethral (smooth muscle) dyssynergia.

Incompetent urethral closure mechanism

An *incompetent* urethral closure mechanism allows leakage of urine. The negative urethral closure pressure[1] may be persistent (continuous leakage) or due to a rise in abdominal pressure (genuine stress incontinence) or an involuntary fall in intraurethral pressure in the absence of detrusor activity (unstable urethra). Detrusor overactivity is more likely to be accompanied by leakage if there is an involuntary decrease in urethral pressure.

SENSATION

Sensation is difficult to evaluate because of its subjective nature. It is usually assessed by questioning the patient in relation to the fullness of the bladder either during the taking of the clinical history or during cystometry. There are two groups of sensory modalities: Proprioception, which serves to inform on tension and contraction, and exteroception, which serves to inform on pain, touch and temperature.
Sensation can be classified broadly as follows:

1) normal
2) hypersensitive
3) hyposensitive

Reference

1. International Continence Society Committee on Standardisation: First Report
English: Brit J Urol **48**: 39~42, 1976
Eur Urol **2**: 274~276, 1976
Urol int **32**: 81~87, 1976
Scand J Urol Nephrol **11**: 193~196, 1977
J Urol **121**: 551~554, 1979
German: Urologe A **15**: 93~96, 1976
French: J Urol Nephrol (Paris) **6**: 429~436, 1976

I.C.S. STANDARDISATION COMMITTEE REPORTS

(1) In English

Bates P, Bradley WE, Glen E, Melchior H. Rowan D, Sterling A, Hald T
First report on the standardisation of terminology of lower urinary tract function.
Br J Urol **48**: 39~42, 1976
Eur Urol **2**: 274~276, 1976
Scand J Urol Nephrol **11**: 193~196, 1977
Urol Int **32**: 81~87, 1977

Bates P, Glen E, Griffiths D, Melchior H, Rowan D, Sterling A, Zinner N, Hald T.
Second report on the standardisation of terminology of lower urinary tract function.
Br J Urol **49**: 207~210, 1977
Eur Urol **3**: 168~170, 1977
Scand J Urol Nephrol **11**: 197~199, 1977

Bates P, Glen E, Griffiths D, Melchior H, Rowan D, Sterling A, Zinner N, Hald T.
Standardisation of terminology of lower urinary tract function: First and second reports.
Urology **9**: 237~241, 1977

Bates P, Bradley WE, Glen E, Griffiths D, Melchior H, Rowan D, Sterling A, Zinner N, Hald T.
The standardisation of terminology of lower urinary tract function.
J Urol **121**: 551~554, 1979

Bates P, Bradley WE, Glen E, Griffiths D, Melchior H, Rowan D, Sterling A, Hald T.
Third report on the standardisation of terminology of lower urinary tract function.
Scand J Urol Nephrol **12**: 191~193, 1978
Br J Urol **52**: 348~350, 1980

(2) In German

Bates P, Bradley WE, Glen E, Melchior H, Rowan D, Sterling A, Hald T.
Die Funktion der unteren Harnwege. 1. Standard -isierung der Terminologie von Incontinenz, Zy stometrie, Urethra-Druckprofil und Masseinheiten.
Urologe A **15**: 93~96, 1976
Zschr Urol **69**: 421~426

Bates P, Rowan D, Glen E, Sterling A, Griffiths D, Zinner N, Melchior H, Hald T.
Die Funktion des unteren Harntraktes, 2. Bericht zur Standardisierung der Terminologie.
Urologe A, **19**: 189~191, 1980

Bates P, Bradley WE, Glen E, Griffiths D, Melchior H, Rowan D, Sterling A, Hald T.
Die Funktionen des unteren Harntraktes. 3. Bericht zur Standardisierung der Terminologie: Verfahren zur Miktionsanalyse, Druck-Fluss-Beziehungen, Restharn.
Urologe A, **19**: 315~317, 1980

(3) In French

Bates P, Bradley WE, Glen E, Melchior H, Rowan D, Sterling A, Hald T.
Standardisation de la terminologie de la fonction du bas appareil urinaire. Incontinence, cystometrie, profil uretral, unites de mesure.
J Urol Nephrol **6**: 429~436, 1976

(Accepted for publicasion, July 2, 1981)